Submission Title:

GMAO OSSE framework in support of PBL mission science

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Abstract

The planetary boundary layer is the bottom layer of the troposphere where most of human activities take place. Atmospheric pollutants are capped by the temperature inversion layer in PBL. The thickness of PBL, ranging from tens of meter to several kilometer, affects pollutant dispersion and air quality. The thickness of PBL typically shows a strong diurnal cycle but it is difficult to model and predict its change because complicated dynamic and thermodynamic processes involved with air-surface exchange of temperature and moisture, convective mixing, surface friction, topography, advection and radiation heating and cooling influence the PBL height. Various parameterization schemes for PBL were developed but the underlying processes of PBL are neither clearly understood nor represented in NWP models and adding large uncertainty into weather and climate predictions.

There are no systematic global observations to provide information on thermodynamic structure of PBL and efforts to explore new spaceborne instruments and measurement techniques are growing. This study aims to develop a PBL OSSE framework leveraging existing GMAO's OSSE system that utilizes GEOS data assimilation and global forecast model (1) to evaluate existing and potential new observation types for the PBL structure analysis and prediction and (2) to test sensitivity of PBL parameterization schemes to PBL forecasts.